SFM Chart by Material

Starting speeds for milling, drilling and tapping, from tool maker published data
Updated October 2026

RPM = (SFM × 3.82) ÷ tool diameter (in.) **IPM = RPM × flutes × chip load**
Example: 1/2 in. 4-flute carbide end mill, annealed 4140, 325 SFM, .002 in. chip load = about 2,480 RPM and about 20 IPM.

MATERIAL	CARBIDE END MILL	HSS END MILL	CARBIDE DRILL	HSS-CO DRILL	TAP (HSS-E)
Aluminum, wrought 6061, 7075	**1,000** [H1]	**260–395** [D2]	**250–360** [G, M]	n/p	**30–80** [O3, D4]
Aluminum, cast A356, 380	**650–750** [H1]	**235** [D2]	n/p	**205–330** [O2]	**30–110** [O3, D4]
Brass / bronze C360 / C932	**225–500** [H1]	**165–275** [D2]	**160** [G]	n/p	**30–195** [O3, D4]
Low-carbon steel 1018, 12L14	**560–755** [D1]	**320–430** [D2]	**215–395** [O1, G, M]	**105–130** [O2]	**50–130** [O3, D4]
Medium-carbon steel 1045	**490** [D1]	**280** [D2]	**195–395** [O1, M]	**70–100** [O2]	**40–80** [O3, D4]
Alloy steel, annealed 4140, 4340	**365** [D1]	**195** [D2]	**195–395** [O1, G, M]	**65–80** [O2]	**40–80** [O3, D4]
Alloy / tool steel, pre-hard 4140 HT, P20, 28–36 HRC	**150–310** [H1, D1]	**120–165** [D2]	**180–280** [M, G]	n/p	**20–60** [O3, D4]
Tool steel, annealed A2, D2, H13	**270** [D1]	**145** [D2]	**180** [G]	**25–40** [O2]	**35** [D4]
Hardened steel 45–55 HRC	**210–255** [D3] (Harvey 7-fl finisher: 60 [H2])	n/p	**65–100** [M] (40–55 HRC)	n/p	n/p
Cast iron, gray Class 30–40	**475** [D1]	**135** [D2]	**230–395** [O1, G, M]	**105–130** [O2]	**35–80** [E, D4]
Cast iron, ductile 65-45-12	**445** [D1]	**215** [D2]	**195–330** [O1, G, M]	n/p	**35–80** [E, D4]
Stainless, free-machining 303, 416	**450** [H1]	n/p	**130–230** [O1]	n/p	**40–80** [O3]
Stainless, austenitic 304, 316	**200–310** [H1, D1]	n/p	**65–230** [O1, G, M]	n/p	**25–80** [O3, D4]
Stainless, PH 17-4 PH	**150** [H1]	n/p	**120–230** [O1, G]	n/p	n/p
Titanium Ti-6Al-4V	**150–225** [H1, D1]	**115** [D2]	**100–180** [O1, G]	n/p	n/p
Nickel alloys Inconel 625 / 718	**70–130** [H1, D1]	**80** [D2]	**65–110** [O1, G, M]	n/p	n/p
Plastics, unfilled Delrin, nylon, acrylic	**800–1,200** [H3]	**275** [D2]	n/p	n/p	**85** [D4]

How to read this chart. These are starting points, not limits. Each cell shows the low to high range published by the makers cited in brackets, and "n/p" means none of them publish a value, so the cell is left blank on purpose. Ranges span different tools, coatings and test conditions, so check the maker data for your exact tool. Harvey steel, stainless, titanium and nickel values are Harvey's 29-37 Rc group. Dormer values are for side milling; reduce speed about 25% for full-width slotting. Metric values converted at m/min × 3.281 and rounded to the nearest 5.

SOURCES

H1 Harvey Tool, Miniature End Mills, Square, Stub & Standard (SF_14000).
H2 Harvey Tool, End Mills for Hardened Steels, Square, 45-68 Rc (7 flute).
H3 Harvey Tool, End Mills for Plastics, Square Upcut, 2 Flute, High Helix.
D1 Dormer Pramet Solid Milling 2024, S716 4-flute carbide end mill, AlCrN, p.100.
D2 Dormer Pramet Solid Milling 2024, C246 HSS-E-PM end mill, TiCN, p.40.
D3 Dormer Pramet Solid Milling 2024, S561 carbide end mill for hard materials, TiSiN, p.144.
D4 Dormer Pramet Threading 2024, EP00TIN HSS-E-PM spiral point machine tap, TiN, p.126.
M Mitsubishi Materials C010A, MVE carbide drill, recommended cutting conditions, pp. L085-L086.
G Garr Tool, General Purpose Drilling Guide, p.328, bright finish.
O1 OSG ADO carbide drill, tech p.306, through coolant.
O2 OSG EX-GOLD HSS-Co TiN drill, tech p.352, external coolant.
O3 OSG HY-PRO cut taps, recommended tapping conditions, tech p.415, rigid setup.
E Emuge-Franken Rekord 1A-H-NT specification sheet, gray and ductile iron.

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